Chapter 3

Guidelines for Encouraging Pedestrian Travel

1. Traffic Calming

a. What is "traffic calming"?

Traffic calming is a relatively new and very different approach to managing the roadway environment. Traffic calming seeks to reduce the dominance and speed of motor vehicles. It employs a variety of techniques to reduce vehicle speeds. Measures can include physical alterations to the horizontal and vertical alignment of the road and changes in priority. In some cases it may be possible to introduce a 30 km/h (20 mph) zone as part of a package of measures.

First developed and applied in several European countries, the principles and techniques of traffic calming are arousing considerable interest in the US today. Traffic calming has been used in the US to retrofit existing residential neighborhoods suffering from excessive through-traffic and in the design of new planned developments. Some techniques employed to calm traffic are familiar to US traffic engineers, others less so. What is different about traffic calming is its use as an overall integrating concept in designing for pedestrians and bicyclists over large areas. Traffic calming is rapidly being seized upon by many local communities and interest groups as an integrated alternative to conventional road planning and design. Its implementation is bound to be controversial because traffic calming reverses and challenges many currently accepted approaches to roadway design.

Aside from accident and casualty reduction, the benefits claimed for traffic calming are manifold. Slower vehicle speeds can create better driver discipline. Less acceleration and braking reduces fuel consumption, vehicle emissions and noise intrusion. Furthermore, the smoother flow of vehicles may actually improve travel times. Traffic calming also provides an opportunity for environmental improvements. Aside from a reduction in noise and air pollution from motor vehicles, aesthetic improvements such as plantings can easily be incorporated into a program of physical alterations to the road space.

In residential areas, traffic calming is frequently applied to foster the concept that roads are "living areas" and should therefore be made safe and attractive. Here particularly, changes to the street scene are applicable, and, where possible, traffic calming should provide community areas, including play spaces and places where people can sit and chat.

Traffic calming need not, however, be confined only to minor roads. In urban and suburban areas, arterial streets and highways carrying fast, heavy traffic generally pose the greatest danger to vulnerable user groups. Measures that reduce the speed and dominance of motor vehicles and facilitate safe passage for bicyclists and pedestrians are thus even more necessary on such main roads. However, the techniques seen as applicable to main urban thoroughfares generally differ from those employed to calm traffic on minor residential roads. A greater variety of features have been developed for minor roads where stricter speed control is unlikely to adversely affect roadway capacity or levels of service.

Normally, traffic calming should be applied as an area-wide technique. To apply it only to a particular street can easily shift accidents, pollution and traffic into neighboring areas.

In order that traffic calming may realize its full potential in terms of creating a safer and more attractive urban environment, it must be part of a wider and longer-term strategy to reduce dependence on private motor vehicles in towns and cities, and promote a modal shift in favor of walking, cycling and public transit.

The growing popularity of traffic calming is attributable to four perceived benefits:

- A significant reduction in road accidents and their severity.
- A greater feeling of security, particularly among vulnerable road users.
- Reclamation of roadway space for non-traffic activity such as play and social interaction.
- Improved visual and aesthetic environments created by landscaping and a reduction in the intrusive presence of motor vehicles.

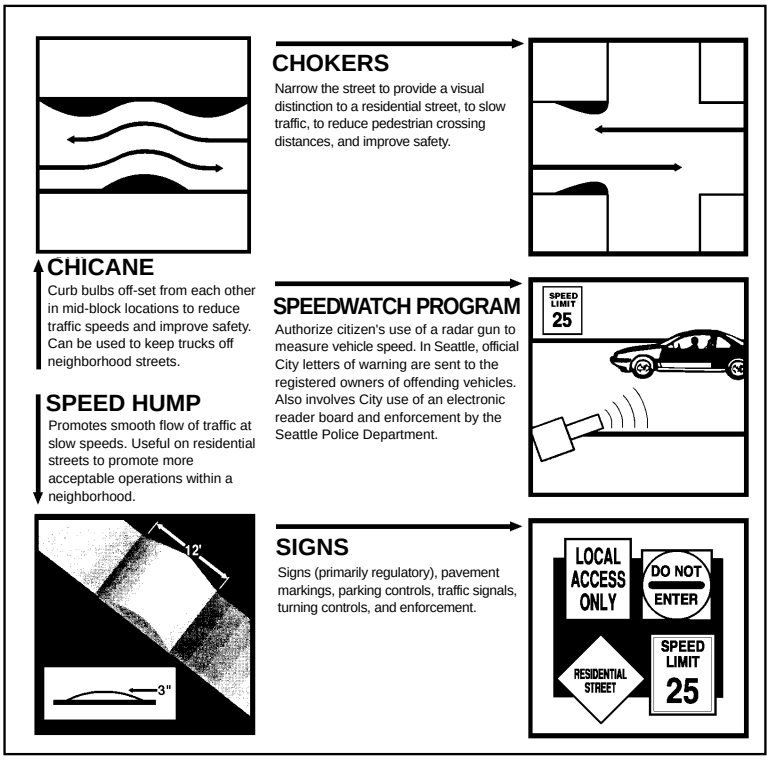
b. Traffic Calming Techniques

Three general observations should be noted from successful traffic-calming schemes that have been implemented:

- Where consistently low speeds, less than 30 km/h (20mph), are required, such as in residential areas, physical traffic-calming features should be positioned sufficiently closely together to deter unnecessary acceleration and braking.
- The use of appropriate signing is important to remind drivers that they are entering a traffic restraint area; public awareness campaigns facilitate the acceptance of lower speeds.
- Sympathetic speed limits, such as 30 km/h (20mph) in residential areas, are used to reinforce the physical speed control measures.

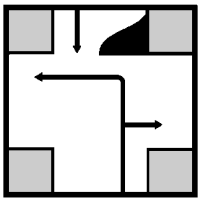
Examples of traffic calming techniques are listed and illustrated in Figures 33 through 39. Additional information can be found in the companion document to these guidelines, NJDOT Bicycle Compatible Roadways and Bikeways. These techniques are a selection of some current measures employed. Similarly, the descriptions of the various features are for illustrative purposes and should not be interpreted as rigid design criteria. It is recognized that the appropriate application of different traffic-calming techniques is dependent on the physical setting. As a result, the selection of appropriate techniques requires application of professional judgement and creativity.

Figure 33
Traffic Calming Techniques



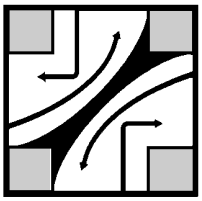
Neighborhood traffic control measures: Managing traffic in place.

Source: Design and Safety of Pedestrian Facilities, ITE, 1994



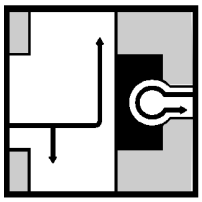
CURB BULB
Description: An extension of a curb built to block one half of the street.

Purpose: To stop vehicles from entering a neighborhood but allow egress.



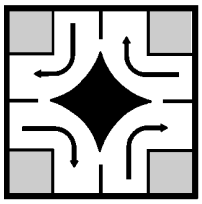
DIAGONAL DIVERTER
Description: An island built diagonally across an intersection.

Purpose: Discourages commuter traffic by forcing turns, returns streets to neighborhood/pedestrian use.



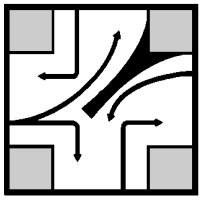
CUL-DE-SAC DIVERTER
Description: A complete street closure with a landscaped mini-park.

Purpose: To eliminate through traffic, separating land uses.



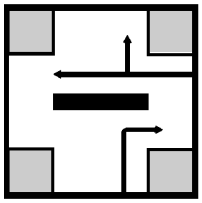
STAR DIVERTER
Description: A star-shaped island placed in an intersection.

Purpose: Discourages commuter traffic by forcing right turns.



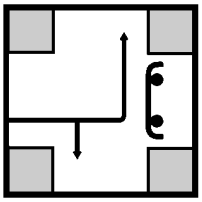
TRUNCATED DIAGONAL DIVERTER
Description: A diagonal diverter with one end open.

Purpose: Discourages commuter traffic by forcing turns.



CHANNELIZATION CURB DIVERTER
Description: Six-inch high curbing placed along the center line of an arterial.

Purpose: To prevent left turns from an arterial to a residential street.



GUARDRAIL CLOSURE
Description: Steel or timber rails on posts to close a street.

Purpose: To eliminate through traffic.

Source: Design and Safety of Pedestrian Facilities, ITE, 1994

Figure 34
Neighborhood Traffic Control Measures

Road Humps and Speed Tables

***Description*:** Raising the surface of the road over a short distance, generally to the height of the adjacent curb. Humps are longer than speed bumps and can be round or flat topped; the latter are known as "speed tables" and can extend over 3 to 9 meters (10 to 30 feet). Humps may extend curb-to-curb, or may be cut back at the curb with tapered sides to facilitate drainage and permit a bicycle bypass.

Figure 35
Speed Table

Source: Traffic Calming, CART, 1989, STOP, 1993

While generally employed on residential roads, humps are permitted on main roads subject to a speed limit of 50 km/h (30 mph) or less. On higher speed roads, these concepts may still be appropriate to call attention to important pedestrian crossings or areas of congestion. However, care must be taken in design to provide appropriate vertical transitions.

Speed tables frequently are coincident with a pedestrian crossing.

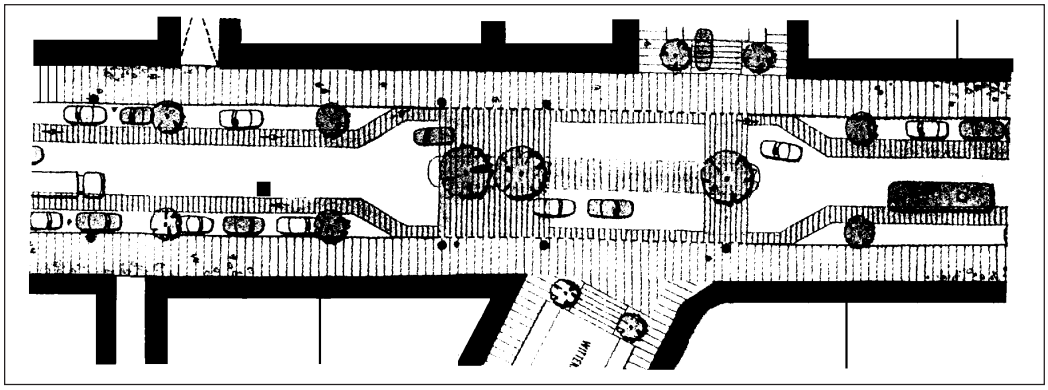
Design Considerations: To ensure the effectiveness of road humps while enabling bicyclists to negotiate them with a reasonable degree of comfort:

- gradients on the approach and exit slopes should not exceed 1:6 (16%);
- ramp faces should be clearly indicated;
- all materials employed should be skid resistant;
- the leading edge of ramps should be flush with the road surface;
- humps should be situated sufficiently far from an intersection to allow turning bicyclists to regain an upright position before they encounter the obstruction.

Where flat top humps (speed tables) are coincident with a pedestrian crossing they should extend from curb-to-curb.

Speed humps in the vicinity of bus stops should be designed to permit buses to either completely clear the raised roadway or to straddle the hump. (Bus passengers are particularly vulnerable to the adverse effects of humps.)

Figure 36
Mix of Traffic Calming Elements

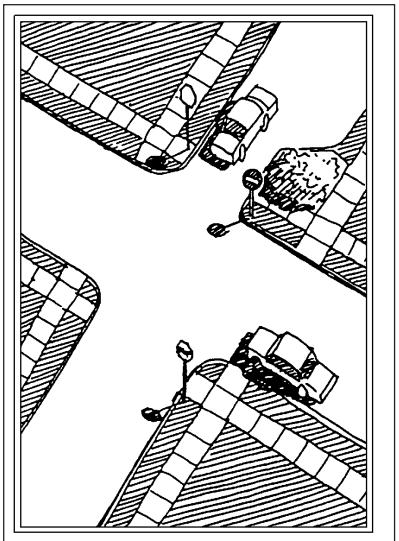


Source: Traffic Calming, CART, 1989, STOP, 1993

Traffic Throttles/Chokers or Neck-downs

Description: The narrowing of a two-way road over a short distance to a single lane. Sometimes these are used in conjunction with a speed table and coincident with a pedestrian crossing.

Design Considerations: Throttles are generally only appropriate where traffic flows are less than 4-5,000 vehicles/day. Above this level considerable delays will occur in peak periods.



Source: State of the Art Report: Residential Traffic Management, FHWA, 1980

Figure 37
Choker/Neckdown

To reduce the risk of bicyclists being squeezed, throttles should generally be used in conjunction with other speed control measures, such as a speed table at the narrowing. Slower-moving drivers will be more inclined to allow bicyclists through before trying to pass. Where bicycle flows are high, consideration should be given to a separate right-of-way for bicyclists at the throttle point, possibly by means of a not-quite-central refuge.

Clear signing should indicate traffic flow priorities.

A textured surface such as blockwork may be used to emphasize pedestrian crossing movement. Substituting this for the normal roadway surface material may also help to impress upon motorists that lower speeds are intended.

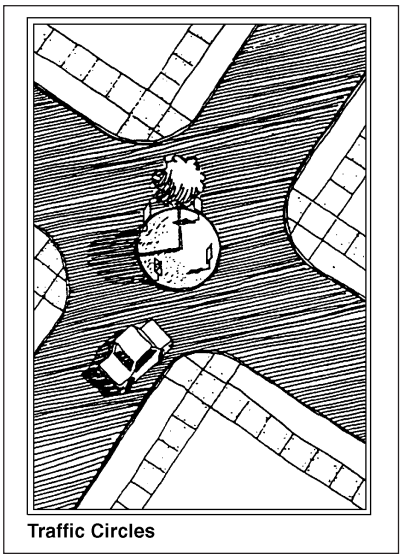
Nevertheless, such measures should not confuse pedestrians with respect to the boundary of the roadway area over which due care should still be taken, especially where a road is raised to the level of the adjacent walkway. As with all crosswalks, appropriate care must be taken to alert the blind and others with limited vision of the presence of a crossing. A tactile material should be provided at the approach which can be detected with long cane techniques. Similarly a contrasting color and texture should be provided for the benefit of the visually impaired.

Roundabouts or Traffic Circles

Description: Small radius traffic circles located at street intersections or mid-block locations. Some have raised centers, others are little more than painted circles on the road.

Design Considerations: Roundabouts should preferably have sufficiently raised and highly visible centers to ensure that motorists use them correctly rather than over-running. Frequently, roundabouts with an interior area greater than 7 square meters (75 square feet) are planted. Small roundabouts may be only painted islands with a flexible barrier.

Complementary speed reduction measures, such as road humps on the approach to roundabouts can improve safety. Clear signing is essential.



Source: State of the Art Report: Residential Traffic Management, FHWA, 1980

FIGURE 38
Traffic Circle

The design of roundabouts must ensure that large radius vehicles will be able to negotiate the roadway, in particular, garbage trucks, fire engines, moving vans and school buses, all of which can be anticipated in residential areas. However, on low speed streets with AADT less than 2000, it is appropriate to assume that these large vehicles can encroach into the opposite lane when entering or exiting a roundabout.

Raised Intersections

***Description*:** The roadway is raised at a street intersection with a visible roadway ramp on each approach. The platform created in the intersection is elevated to curb level and should have a distinctive surfacing.

Physical obstructions such as bollards or planters can be used to restrict the area to which vehicles have access.

***Design Considerations*:** Roadway ramps should not exceed a maximum gradient of 1:6 (16%).

Distinctive surfacing materials should be skid resistant, particularly on inclines. Ramps should be clearly marked to enable bicyclists to identify and anticipate them, particularly in conditions of poor visibility.

As with all crosswalks, care must be taken to ensure that visually impaired people have adequate cues to advise them of the roadway area. Tactile strips may be appropriate and color variation will aid those who are partially sighted.

Plug "No-Entry" (with Bicycle Slip)

***Description*:** A cul-de-sac created by blocking access in one direction at one point in the street to motor vehicles. Unlike a traditional cul-de-sac, a "plugged" street remains open for use by bicyclists and pedestrians.

Design Considerations: Bicycle exemption should be provided as a general rule, and designed to minimize the likelihood of obstruction by parked vehicles.

Signing should acknowledge the continued existence of the route as a through one for bicyclists.

Irregular or Textured Surfaces

Description: The use of non-asphalt roadway surfaces such as brick, paving blocks or blockwork, cobblestones to reinforce the concept of a "traffic restricted" area.

Design Considerations: Care must be taken in the choice of materials to ensure that they do not pose a danger or deterrent to bicyclists and pedestrians. Cobblestones present special difficulties and are particularly discouraging for bicyclists on steep slopes because they make it harder to maintain momentum when riding uphill. Similarly, paving stones with chamfered edges impair a bicyclist's stability and should be avoided.

Cobblestones or other rough surface should not be used along pedestrian routes since they represent both an obstacle and a danger for persons in wheelchairs, walkers or other devices.

In residential areas consideration must be given to the noise that might be generated from textured surface materials.

Tortuous Roads

Description: Roads designed to meander, occasionally turning sharply, reducing the image or perception of a straight and open road, thereby encouraging low vehicular speeds.

This technique is often used in new housing developments, incorporating courtyards or cul-de-sacs and thus removing through traffic.

Design Considerations: Tortuous roads are generally planned during the design of a new road rather than superimposed on an existing one. The siting of buildings may be used to accent the meanders.

Designers should be aware of the need to assure accessibility to residential properties, both in terms of emergency vehicles and service vehicles. Tortuous roads will not be viable if they severely restrict accessibility.

Source: Bicycle Federation of America

Figure 39
Woonerf

"Woonerf" or Shared Surfaces

Description: The traditional distinction between pedestrian space and vehicular space is removed and a "living courtyard" or common area is shared by both pedestrians and vehicles.

This technique is common in European communities and is created by narrowing the street entry on either end, typically on short, isolated residential streets, and installing obstacles such as planters, parking, etc., at irregular intervals to slow traffic.

Design Considerations: Woonerfs are generally acceptable for short distances only and should be used in conjunction with other physical speed control features such as textured pavement or posted 10 to 15 km/h (8 to 10 mph) speed limit signs.

c. Traffic Calming and Bicyclists

In areas subject to traffic restraint or low speed limits, special facilities for bicycles are not usually needed or provided since traffic calming offers many inherent benefits for bicyclists. Mixing with slower traffic, bicyclists can move around in comparative safety. Traffic calming also offers a more bicycle-friendly alternative to wholly pedestrianized streets. Some traffic calming measures may also be particularly appropriate on older and narrower streets, which are too narrow to allow for the provision of special bicycling facilities.

Nevertheless, poorly-designed traffic-calming facilities can inconvenience or even endanger bicyclists. Bicyclists are particularly susceptible to changes in surface height and texture, and may be put at risk by poorly-considered road narrowing. Speed-reducing measures should not be so "harsh" as to discourage bicyclists from using traffic-calmed areas. Design guidelines to accommodate bicyclists are discussed in the companion volume to this document, NJDOT Bicycle Compatible Roadways and Bikeways.

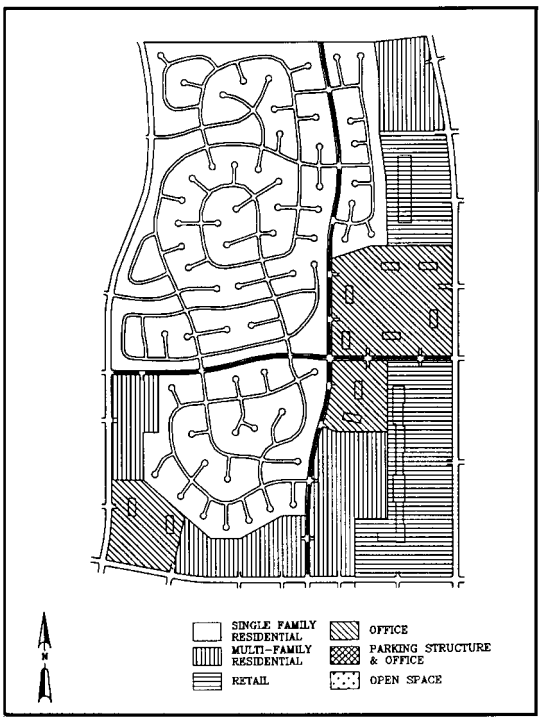
2. Traditional and Neo-Traditional Neighborhood Design

a. Background

Traditional or Neo-Traditional Neighborhood Design (TND or NTND) is a development or redevelopment concept which reflects principles and techniques that link land use with transportation choices. As an alternative to suburban sprawl, TND/NTND proposes a scale and mix of land use types and a transportation network for suburban communities, that differs from suburban development patterns of the recent past. Past development has been characterized primarily by suburban sprawl, cul-de-sacs, low-density and auto-oriented land use. TND/NTND communities are characterized by neighborhood centers and civic spaces within walking distance of one another, compact development patterns with a mix of housing choices and other land uses, connected street networks, typically in a grid pattern, design features that include narrow street pavement widths and pedestrian-scale improvements. These communities are often also integrated with transit through pedestrian linkages. See Figures 40 and 41.

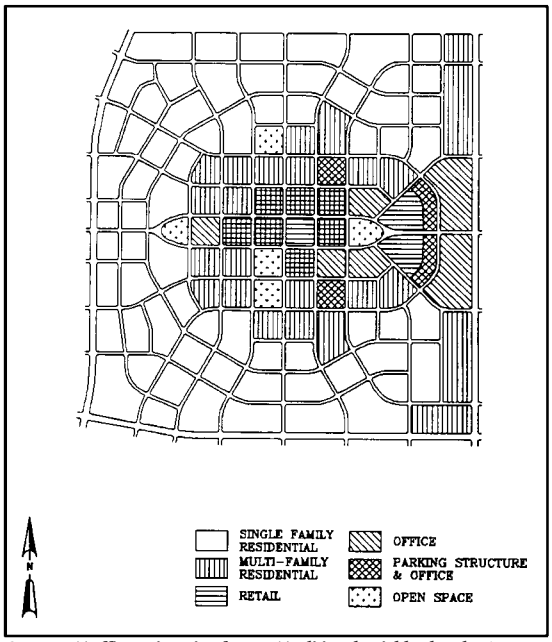
All of these elements contribute to creating a more pedestrian-friendly environment that will encourage walking trips. Application of TND/NTND transportation principles are described in the following section.

Figure 40
Suburban Land Use



Source: Traffic Engineering for Neo-Traditional Neighborhoods: An Informational Report, ITE Technical Committee 5P-8, 1993

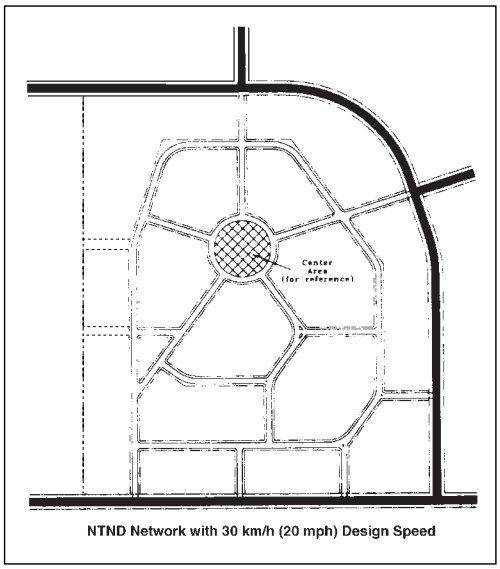
Figure 41
Neo-Traditional Land Use



Source: Traffic Engineering for Neo-Traditional Neighborhoods: An Informational Report, ITE Technical Committee 5P-8, 1993

b. TND/NTND Transportation Principles and Techniques

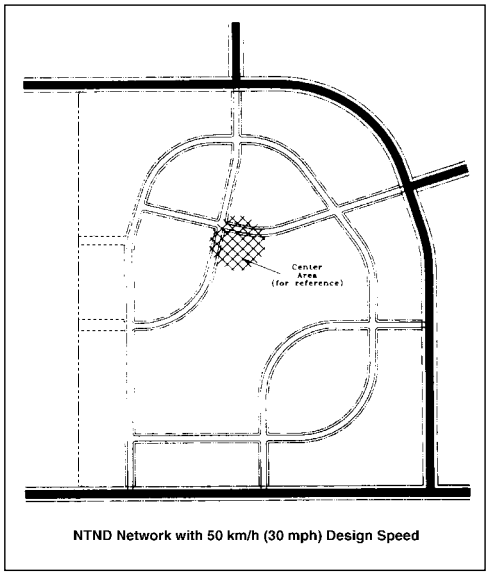
TND/NTND type road guidelines reduce roadway width, horizontal curve radii and intersection of curb radii, as Figures 42 through 44 indicate. Suggested curb radii on local streets are 3.0 to 4.6 meters (10 to 15 feet) and on subcollectors, 4.6 to 6.1 meters (15 to 20 feet). In addition, TND site planning principles are very consistent with the SDRP "Communities of Place" concepts.



Source: Traffic Engineering for Neo-Traditional Neighborhoods: An Informational Report, ITE Technical Committee 5P-8, 1993

Figure 42
NTND Network with 30 km/h (20 mph) Design Speed

From an urban design perspective, a compact network of streets, with sharp turns and rectilinear road patterns as shown in Figure 42, will help create a strong visual identity and sense of place. This sense of place is further promoted by requiring buildings to front close to the street to create a sense of enclosure and to shorten the walking distances between destinations. These bounded spaces can allow for variations for special buildings or events which the pedestrian can appreciate at a walking pace. Thus, civic buildings such as meeting halls, theaters, churches and museums often open onto squares. Sometimes streets end at a civic building to accentuate their importance and provide aesthetic "vista terminations" which help to create this "sense of place" (Figure 45). These elements of design make for memorable views along streets and for neighborhood "legibility" that bland suburban designs cannot begin to emulate.



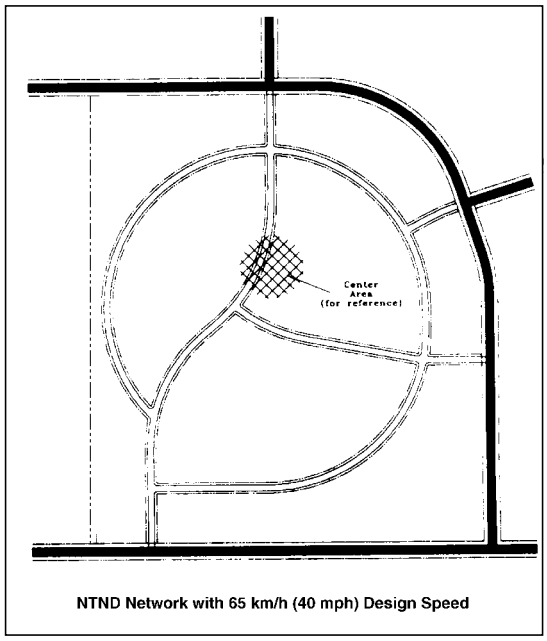
Source: Traffic Engineering for Neo-Traditional Neighborhoods: An Informational Report, ITE Technical Committee 5P-8, 1993

Figure 43
NTND Network with 50 km/h (30 mph) Design Speed

Grid patterns of narrow, well-designed streets improve community access in spite of low design speeds. The narrower streets provide smaller, more numerous intersections that disperse congestion. The gridded network of streets that is built into the TND plan disperses traffic from the major generators to a myriad of local streets. This is in direct contrast to the conventional hierarchical street system which focuses traffic from numerous generators onto single links of the arterial system (Figure 46). The gridded network that is built into the TND also disperses the turning-movement load onto a large number of intersections, rather than funneling a large number

Figure 44

NTND Network with 65 km/h (40 mph) Design Speed



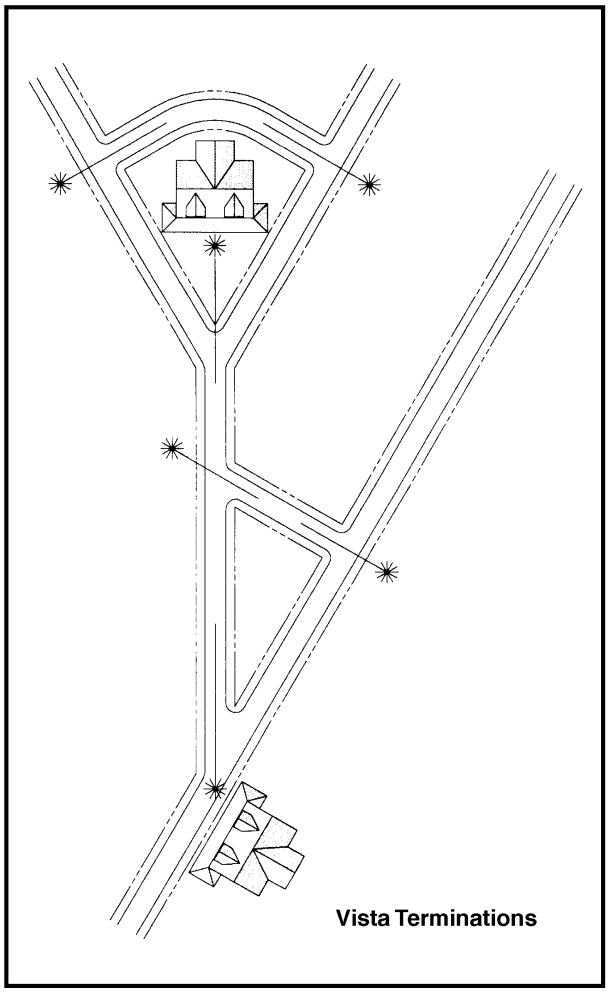
Source: Traffic Engineering for Neo-Traditional Neighborhoods: An Informational Report, ITE Technical Committee 5P-8, 1993

of turning movements into a single intersection.

A simple example illustrates the surprising amount of turning-movement capability that is gained in an intersection grid of streets, contrasted to a single multi-lane intersection (see computation on Figure 47).This example illustrates a fundamental point of network capacity: the total intersection capacity of a street system increases dramatically as the network expands.

Figure 45

Vista Terminations



Source: Traffic Engineering for Neo-Traditional Neighborhoods: An Informational Report, ITE Technical Committee 5P-8, 1993

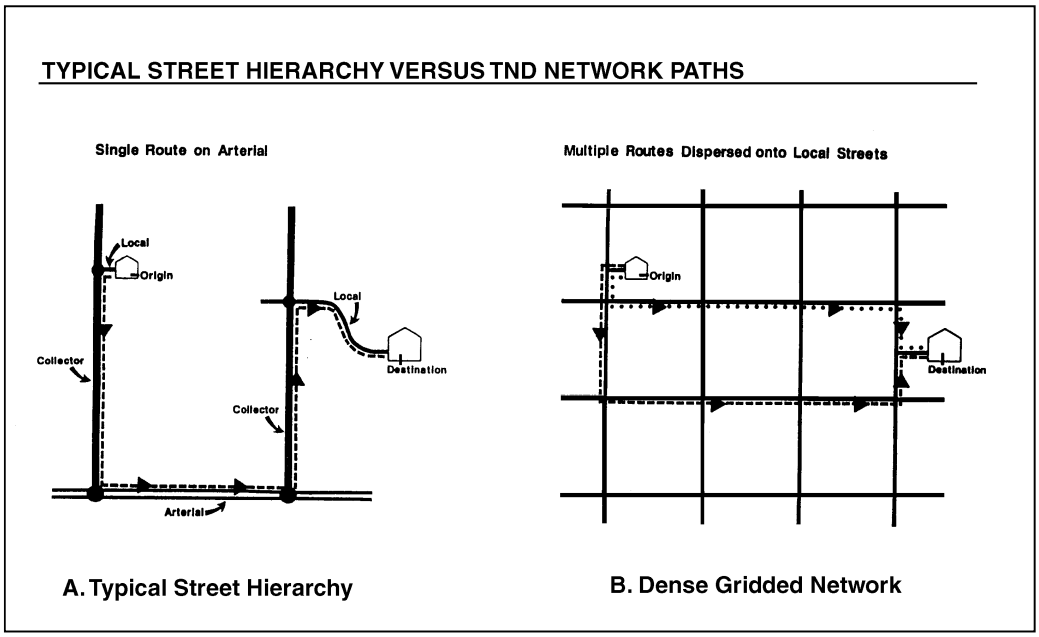


Figure 46

Typical Street Hierarchy Versus TND Network Paths

Source: Traditional Neighborhood Development, Will the Traffic Work?, Kulash, 1990.

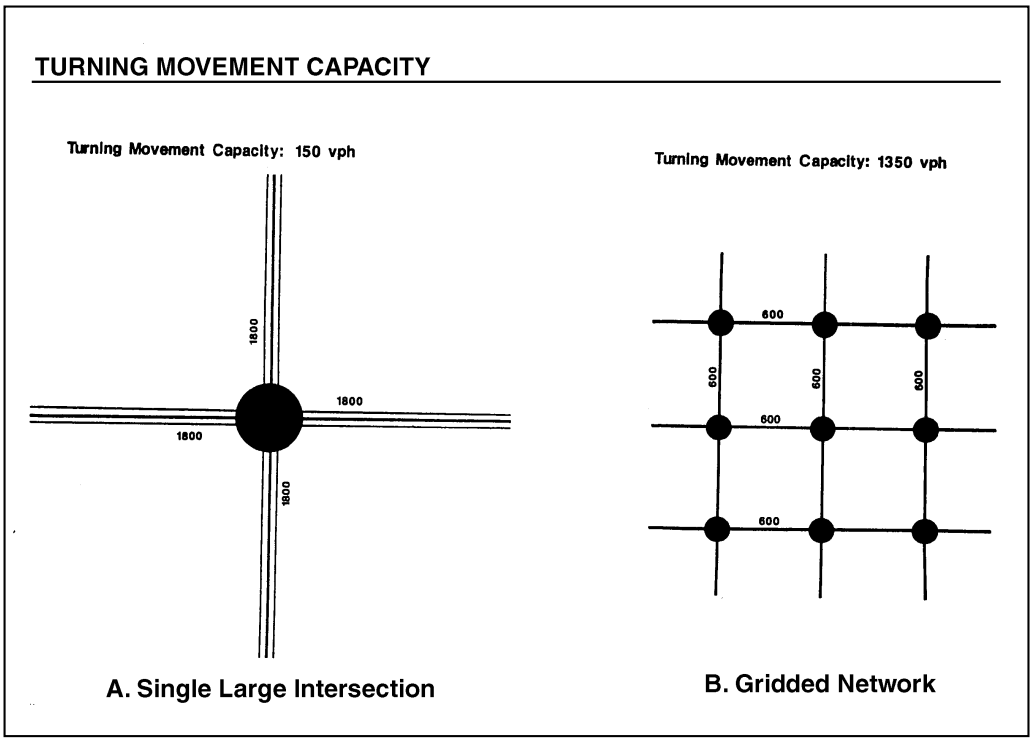


Figure 47

Turning Movement Capacity

Source: Traditional Neighborhood Development, Will the Traffic Work?, Kulash, 1990.

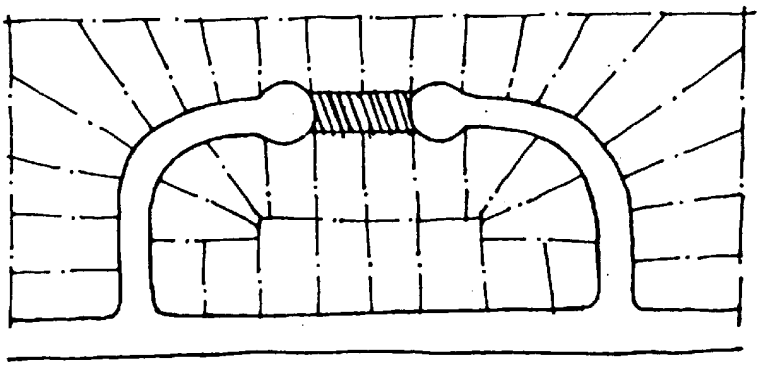
3. Pedestrian Linkages

When a grid or other dense street network is not available, pedestrian linkages should be provided to maintain walking continuity. Cul-de-sacs, loop roads and similar treatments which disrupt pedestrian continuity should incorporate pedestrian linkages such as "cut-thrus" to adjoining developments. See Figure 48. These shortcuts enable pedestrians to travel by the most direct route between destinations. In most cases, routes will have fewer vehicular conflicts since the pedestrian does not have to use an arterial to get from one local street to another. Streets with a mid-block length greater than 180 meters (600 feet) should provide a mid-block pedestrian linkage to adjoining blocks.

Similarly, large lot commercial developments, such as office buildings or shopping centers, should provide numerous linkages with surrounding residential areas to permit nearby residents to walk to the site. Linkages should also be provided between adjoining commercial/ residential/office uses; for example, walkways connecting an office building parking area with an adjacent restaurant. It is not necessary to demonstrate that there is a latent demand for walking. The linkage is required to service even the single trip if it is generated.

Policy for linkages can be defined in the land use element of municipal master plans, in the circulation element of municipal master plans, and on the official map as provided in the Municipal Land Use Law.

Figure 48
Pedestrian Connections and Linkages



Source: Accommodating the Pedestrians, Untermann